

SOME MUSINGS ON GALAXY MORPHOLOGY, GALACTIC COLORS AND THE ENVIRONMENTS OF GALAXIES

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ABSTRACT

Careful inspection of large-scale photographs of Shapley-Ames galaxies seems to show a smooth transition between the morphological characteristics of galaxies located on the narrow red, and on the broad blue, sequences in the galaxian color-magnitude diagram. In other words there does not appear to be a dichotomy between blue and red galaxies. Both the colors and the morphologies of galaxies are found to correlate strongly with their environments. Red and early-type Shapley-Ames galaxies are dominant in clusters, whereas blue late-type star forming objects dominate the general field. Interestingly the colors and morphologies of galaxies in small groups resemble the field and differ from those in clusters. As noted by Baade the presence of dust and star formation are very closely correlated, except in a few galaxies that probably had unusual evolutionary histories. Over the entire range from S0 to Sc there is no significant difference between the integrated colors of normal and barred objects suggesting that the formation of a bar does not significantly affect the stellar evolutionary history of a galaxy.

Subject headings: galaxies: fundamental parameters

1. INTRODUCTION

In his pioneering investigation of galaxy morphology Hubble (1926) showed that extra-galactic nebulae appear to fall along a continuous sequence that extends from his “early” type galaxies of type E to “late” type spirals of type Sc. Various modifications and improvements to this basic scheme were subsequently made by Hubble (1936), de Vaucouleurs (1959), van den Bergh (1960a,b) and Sandage (1961). This so-called Hubble sequence, and

the “tuning-fork” diagram that takes into account the dichotomy between normal and barred spirals, has dominated our thinking about galaxy morphology (van den Bergh 1998, Sandage 2005) for the last three quarters of the Twentieth Century. Very recently the availability of enormous homogeneous surveys of galaxies has, however, suggested that the diversity of galaxy morphologies may exhibit a previously unsuspected dichotomy between objects that fall along blue and red sequences in the luminosity versus color diagram. This effect is beautifully shown in Consolice (2006), and even more clearly in Wang et al. (2007). Recent detailed bibliographies of work on this subject are provided by Cattaneo et al. (2006) and Renzini (2006). Furthermore Faber et al. (2006) show that this apparent dichotomy between the blue and red sequences of galaxies extends back in time to a redshift of at least $z = 1.0$. Arnouts et al. (2007) find evidence for a major buildup of the red sequence for $1 < z < 2$. Finally Labé et al. (2007) observe that the red sequence appears to be absent at $z \sim 3$.

The dependence of the relative populations along the blue and red sequences on galaxy luminosity is discussed in detail by Baldry et al. (2004). Baldry et al. (2006) also provide interesting information on the dependence of the relative strengths of the blue and red galaxy sequences on environmental density. To explain the observed bi-modality in the color-luminosity diagram it has been suggested that, after a critical epoch at $z \sim 3$, only those dark matter halos below a critical shock-heating mass of $\sim 10^{12} M_{\odot}$ enjoyed inflow of cold gas that could form stars, whereas cooling and star formation were shut down abruptly above this mass. According to Cattaneo et al., and references cited therein, galaxies arrive at the bright end of the red sequence by dissipationless (“dry”) mergers, or alternatively via “wet” mergers among the most luminous galaxies of the blue sequence. It is one of the purposes of the present investigation to search for possible systematic morphological differences between galaxies on these blue and red sequences. In particular it is attempted to answer the question asked by Ball et al. (2006): Does the morphology of galaxies reveal anything that colors do not?

2. THE DATA

In his recent investigation Consolice (2006) used a data base consisting of the physical characteristics of a large (22 121 galaxies), but quite inhomogeneous, database drawn from the RC3 catalog of de Vaucouleurs et al. (1991). The present investigation is based on the much smaller, but far more homogeneous, sample provided by the 1246 galaxies in *The Revised Shapley-Ames Catalog of Bright Galaxies* (Sandage & Tammann 1981). This catalog contains the largest and most uniform existing collection of high quality galaxy classifications. All of these classifications are based on inspection of plates obtained with large reflecting

telescopes. Furthermore beautiful large-scale photographs of each of these galaxies have been published in the monumental *Carnegie Atlas of Galaxies* (Sandage & Bedke 1994). Table 1 lists those galaxies in the Revised Shapley - Ames catalog for which integrated $(U - B)_o$ colors are also given in the *Third Reference Catalogue of Bright Galaxies* of de Vaucouleurs et al. (1991). Such $(U - B)_o$ colors should provide a sensitive measure of the current rate of star formation. These colors were derived by applying statistical corrections for both Galactic foreground reddening and internal dust reddening. It should be noted that these corrections for reddening are particularly uncertain for galaxies at low Galactic latitudes. To remind the reader of this fact all U-B colors of galaxies with $|b| < 25.0^\circ$ in Table 1 are followed by a colon (:). By the same token the statistical corrections to de Vaucouleurs et al. “face-on” colors are, of course, particularly large and uncertain for dusty almost edge-on spirals such as M31. Also listed for all of the galaxies in Table 1 is a somewhat simplified version of the morphological classifications by Sandage & Tammann, as well as the absolute magnitudes $M_{B_T}^{o,i}$ (which will subsequently, for the sake of simplicity, be referred to as M_B). Except for Local Group members, the luminosities adopted by Sandage & Tammann were reduced by 0.73 mag so that they are now based on a Hubble parameter of $70 \text{ km s}^{-1} \text{ Mpc}^{-1}$, rather than on the value of $50 \text{ km s}^{-1} \text{ Mpc}^{-1}$, that was favored by Sandage & Tammann (1981). Following Conselice (2006) the galaxies in the red sequence and those in the blue sequence were separated by an empirical dividing line defined by the relation

$$M_B = -14.98 - 31.8 (U - B)_o. \quad (1)$$

In Table 1 all galaxies that fall to the blue of this relation are designated “B”, whereas those that fall to the red of it have been designated “R”. Following Conselice (2006) a small number of dwarf galaxies fainter than $M_B = -18.00$ were excluded from the sample and are not listed in Table 1.

The total number of galaxies contained in the final sample listed in Table 1 is, per chance, exactly 800. For galaxies North of $\delta = -27^\circ$, the table also gives information on the environment of each galaxy based on inspection of their images on the prints of the Palomar Sky Survey. Objects that appeared to be accompanied by fewer than three non-dwarf companions were provisionally assigned the field [F], those that appeared to have 3 to 6 non-dwarf companions were tentatively allocated to groups [G], and those that seemed to have more than six non-dwarf companions were assumed to be cluster [C] members. These designations were based only on visual inspection of Sky Survey prints and not on radial velocity data. This approach was adopted because the large random motions superimposed on the smooth Hubble flow can, in some cases, result in misleading distance estimates for the relatively nearby galaxies in the Shapely-Ames Catalog. Clearly the environmental information given in Table 1 should only be regarded as being indicative in nature. Nevertheless it is

encouraging [see Section 6] that a very strong correlation is found between the environmental classes “F”, “G” and “C” and the morphological types and colors of the galaxies located in them. Since the Local Group and the Virgo cluster extend over many Palomar Sky Survey prints, memberships in these two features were taken from the catalog of van den Bergh (1960c). Finally Table 1 gives visual estimates of the amount of dust present in, and the intensity of star formation in, all of the galaxies contained in Volume 1 (types E - Sb) of *The Carnegie Atlas of Galaxies* (Sandage & Bedke 1994).

3. THE COLOR-LUMINOSITY DIAGRAM

As Choi et al. (2007) have recently reminded us absolute magnitude and morphology are the most important parameters characterizing the physical properties of galaxies. Although the present investigation contains two orders of magnitude fewer data points than their work it provides much more accurate morphological information since the galaxies were sorted into a dozen or so morphological classes, compared to the two broad classes [E/S0 and S/Ir] used by Choi et al. These two investigations therefore provide complimentary types of information.

In van den Bergh (2007) it was pointed out that there appears to be a contradiction between the seeming continuity of the Hubble sequence E - Sa - Sb - Sc - Ir and the apparent bimodality that is exhibited by the distribution of galaxies in the color-luminosity diagram. It is one of the purposes of the present paper to see if the uniform and high quality of the morphological classifications of galaxies in the Shapley-Ames catalog can throw any light on this apparent discrepancy. Figure 1 shows a color magnitude diagram for all of the 800 Shapley-Ames galaxies for which de Vaucouleurs et al. (1991) give intrinsic $(U - B)_o$ colors, and for which Sandage & Tammann (1981) list luminosities and accurate morphological classifications. The figure clearly shows that the intrinsic color- magnitude diagram of nearby galaxies is bimodal. However, this bimodality appears less clear-cut than that exhibited by similar data for all RC3 galaxies with $(U - B)_o$ colors that are plotted in Figure 7 of Conselice (2006) and for that seen in the M_r versus g-r diagram plotted in Figure 2 of Wang et al. (2007). A color-magnitude diagram for the elliptical galaxies in Table 1 is shown in Figure 2. Such E galaxies are seen to scatter about a line that is parallel to, but ~ 0.30 mag redder, than Eqn. (1) which separates red and blue galaxies. A few objects that scatter to the left (blue) of the mean relation for ellipticals are, presumably, galaxies that still harbor a low level of star formation. The bluest object in the Figure 2 is the starburst galaxy NGC 1275 (Perseus A). Figure 3 shows a color-magnitude diagram for all Shapley-Ames S0 + SB0 galaxies. The majority of these objects are seen to fall along the same sequence as do the ellipticals in

Fig. 2 but there is an increased scatter towards bluer colors. The bluest object in the figure is NGC 3616. Perhaps surprisingly, no obvious systematic differences are seen between the locations of $S0_1$, $S0_2$ and $S0_3$ galaxies in the M_B versus $(U - B)_o$ diagram. Figure 4 shows that the majority of Sa + SBa galaxies are red, but that they exhibit a considerable scatter in color. In particular there is no longer any obvious concentration of objects associated with the red sequence that is outlined (or dominated by) elliptical galaxies. Figure 5 shows that Sb and SBb galaxies exhibit a large range in colors, with the majority of these objects falling to the blue of Eqn. (1). Finally Figure 6 shows that the overwhelming majority of Sc and SBc galaxies scatter to the left (blue) of Eqn. (1). It is interesting to note that Figures 3, 4, 5 and 6 exhibit no systematic difference between the distribution of S0 and SB0, Sa and SBa, Sb and SBb or Sc and SBc galaxies. Plots of Sab + SBab and of Sbc + SBbc galaxies show that same conclusion also holds for those objects. This observation suggests that the presence, or absence, of a bar does not strongly affect the evolutionary history of star formation in a galaxy. I am indebted to Lia Athanassoula for pointing out to me that the reason for this may be that the presence of a bar merely rearranges the material in the disk of a galaxy without profoundly affecting its evolution. It is noteworthy that spiral galaxies within each of the individual morphological types from Sab to Sc exhibit a large spread in their $(U - B)_o$ colors. Because the morphological classifications by Sandage & Tammann are of such high quality this scatter can not be attributed to errors in the morphological classifications. It follows that there exists a significant range in the rate of star formation within each of the morphological classes Sab, Sb, Sbc and Sc. In other words galaxy morphology and galaxy color appear to provide complementary information on the evolutionary status of a galaxy. The relation between morphology and color may be affected by both differences in the time of onset of gas infall (Kampakoglou & Silk 2007) and on the more recent rate of gas accumulation. Park et al. (2007) have recently reminded us the fact [see, for example, Figure 1 of van den Bergh (1998)] that very late-type galaxies are systematically less luminous than are galaxies of intermediate and early Hubble types. Since early-type galaxies mainly occur in clusters, and very late-type galaxies mostly in the field, there is a systematic difference between the luminosity functions of field and cluster regions. Figures 7, 8 and 9 also show (as has also been emphasized recently by Park et al.) that the brightest very red galaxies in clusters are more luminous than are the brightest very red field galaxies. Finally Table 2 shows the distribution of the various sub-types of S0 galaxies in differing environments. The table shows that $S0_1$ galaxies are most frequent in the cluster environment. However, with $\chi^2 = 8.9$ for 4 degrees of freedom, the distribution of S0 sub-types does not appear to depend significantly on environment.

4. COLOR AND MORPHOLOGY

Broadly speaking the transition between galaxies on the B and on the R sequence in the color-luminosity diagram of galaxies occurs between Hubble types Sab and Sb. To study this transition in detail all of the images of galaxies listed in Table 1, that are shown in Volume 1 (which covers morphological types E, S0, Sa, Sab and Sb) of *The Carnegie Atlas of Galaxies* were inspected. These images show that the strength of the central bulge decreases gradually and systematically along the sequence E-Sa-Sab-Sb, while at the same time the strength of the star forming disk population increases gradually. Careful inspection of all of these images shows no indication of a discontinuity in the morphological characteristics of galaxies as one goes from objects on the R sequence to those that fall along the B sequence. Generally speaking objects that fall to the left of Eqn (1) are of types Sb, Sbc and Sc, whereas most of those to the right of the line defined by Eqn. (1) are of types E, S0, Sa and Sab. Obvious exceptions, such as the very red Sb galaxy NGC 3169, are seen to be exceptionally dusty. On the other hand the rather blue Sab galaxy NGC 6887 may be a misclassified Sb. Finally some Sb galaxies such as NGC 2841 and NGC 7217, which have almost circular spiral arms, are found to lie on the R sequence. In conclusion inspection of all of the available high quality images leaves one with the impression that there is a gradual transition in morphology along the Hubble sequence, rather than a clear-cut dichotomy between galaxies on the B and R sequences. The most likely explanation for the apparent dichotomy exhibited by the color data may be that most cluster galaxies have low star formation rates and $(U - B)_o \sim +0.5$, whereas the majority of group and field galaxies exhibit a wide range in colors with a maximum at $(U - B)_o \sim -0.1$.

The question “Does morphology tell us more than galaxy colors?” does not have a simple answer. For most galaxies the $(U - B)_o$ color correlates closely with morphological type. A large deviation from the normal relation between color and luminosity usually indicates that a galaxy is peculiar in some way, i.e the A + K galaxy NGC 1275. By the same token a deviation from the normal relation between the tilt of spiral arms, and the strength of the central bulge, often points to a galaxy that has probably had an unusual evolutionary history.

5. DUST, MORPHOLOGY AND STAR FORMATION

One of Walter Baade’s favorite sayings was “No dust, no Population I”. Inspection of the full sample of galaxy images shown in *The Carnegie Atlas of Galaxies* beautifully confirms this strong correlation between the presence of dust and star forming activity. Inspection of the images of all those galaxies in Table 1, that are shown in Volume 1 (E-S0-Sa-Sb) of the

Carnegie Atlas of Galaxies (Sandage & Bedke 1994), allows one to classify the visibility of dust on a scale from $D = 0$ (dust free), $D = 1$ (trace of dust), $D = 2$ (dusty), to $D = 3$ (very dusty). Similarly the apparent intensity of star formation can be graded on the scale $S = 0$ (no star formation), $S = 1$ (trace of star formation), $S = 2$ (active star formation) and $S = 3$ (very active star formation). Obvious caveats are that dust and star formation may, in some images, be invisible because it occurs in overexposed regions. Furthermore the visibility of dust will sometimes depend on galaxy orientation (e.g. NGC 7814). Also the evidence for star formation may be more obvious in nearby than in distant galaxies. Nevertheless the data in Table 3 show a very strong correlation between the indices that describe the dust and star formation. It is, however, instructive to note some striking exceptions to “Baade’s rule”. Metal-poor galaxies, such as the Small Magellanic Cloud, exhibit strong star formation, yet show only dim traces of dust absorption. In the present data set this problem is minimized by the fact that dwarf galaxies with $M_B > -18.00$ (which are usually metal-poor, and hence deficient in dust) have been excluded from the data set contained in Table 1. In other cases such as NGC 2146 and NGC 4438 (tidal?) warping appears to have made the dust lanes particularly prominent because spiral arms have been lifted above most of the sources of stellar radiation. There are also a few rather mysterious objects, such as NGC 4826, that exhibit enormous dense dust clouds but few very bright stars. Perhaps such galaxies resemble M82 which appears to lack bright supergiant stars even though it contains a great deal of absorbing dust. Possibly such galaxies had a burst of star formation that ended suddenly a few tens of millions of years ago. Sandage & Tammann (1981) call some objects of this type “amorphous” galaxies. $S0_3$ galaxies are dusty, but usually without obvious evidence for star formation. In some cases the dust distribution seems to be chaotic (e.g. NGC 4753). In others, like NGC 2907, the dust lies in the fundamental plane. The color magnitude diagram for galaxies with no dust ($D = 0$) is shown in Figure 10, and that for galaxies with a trace of dust ($D = 1$) in Figure 11. Inter-comparison of these figures suggests that many of the galaxies that exhibit a trace of dust absorption have star formation, and therefore exhibit bluer (U-B) colors, than do dustless galaxies. Perhaps surprisingly, the color-magnitude diagrams for galaxies with strong ($D = 2$) or very strong ($D = 3$) visual dust absorption have color-magnitude diagrams that differ but little from that for galaxies that exhibit only a trace ($D = 1$) of dust absorption. Possibly this observed effect is due to internal reddening in very dusty galaxies, canceling out the effects of young blue stars on the integrated colors of galaxies.

Inspection of Figure 12 shows that those galaxies in Volume 1 of *The Carnegie Atlas of Galaxies*, in which no star formation is visible ($S = 0$), fall along a sequence that lies 0.3 mag to the red of the dividing line given by Eqn. (1). On the other hand Figure 11 shows a much broader integrated color distribution for galaxies with $S = 1$ that exhibit some evidence for

star formation.

6. GALAXY MORPHOLOGY AND ENVIRONMENTAL DENSITY

It was first pointed out by Hubble (1936, p.81) that the nature of galaxian populations depends on the density of their environment, with early type galaxies dominating in dense regions of the Universe. The nature of this relation was explored in detail by Dressler (1980) and has most recently been discussed by Hogg et al. (2004), who showed that bulge dominated galaxies which have large Sérsic indices, mainly occur in dense regions. In the present investigation all Shapley-Ames galaxies with $\delta > -27^\circ$ were assigned to clusters (C), groups (G) and the general field (F) by inspection of the prints of the Palomar Sky Survey, using the criteria described in Section 2. As Whiting et al. (2007) have recently pointed out “[T]he idea of a visual survey on photographic material appears almost quixotic”. Nevertheless this appears to be the most efficient way of assessing the environmental characteristics of nearby galaxies, such as those contained in the Shapley-Ames catalog. It should, of course, be emphasized that the division of galaxies into F, G and C regions is an artificial one since, as Park et al. (2007) have emphasized recently, the properties of galaxies appear to vary smoothly as a function of environmental density. The results of the present survey are shown in Figures 7, 8 and 9, These figures show that, in the M_B versus $(U - B)_o$ diagram, cluster galaxies overwhelmingly occur to the right (red) of the line defined by Eqn. (1), whereas field galaxies mostly scatter to the left (blue) of this relation. From their study Park et al. (2007) find that high-density regions contain very bright galaxies, whereas low-density regions do not. Inspection of Figures 7, 8 and 9 appears to show a similar trend for the reddest galaxies having $(U - B)_o > +0.50$. However, a Kolmogorov-Smirnov test shows that this effect does not reach a respectable level of statistical significance in the present dataset. Furthermore, the distribution of $S0_1$, $S0_2$ and $S0_3$ galaxies is not found to differ significantly between cluster and field regions.

Table 4 shows the distribution of morphological types of the galaxies listed in Table 1 as a function of environment. This table clearly shows that early type galaxies are most frequent in clusters, and that objects of late type predominate in the field. A Kolmogorov-Smirnov test shows that there is $< 0.01\%$ probability that early-type and late-type galaxies have the same relative frequency distribution in clusters and in the field. Finally Table 5 shows that the galaxies in clusters are mainly red and that those in the field are predominantly blue. A K-S test shows that there is $< 0.01\%$ probability that the distribution of intrinsic colors in clusters and in the field have been drawn from the same parent distribution of intrinsic colors. Similarly K-S tests of the data listed in Tables 4 and 5 show probabilities

of 0.6% and 0.2% respectively for the similarity of morphological types and intrinsic colors of galaxies in clusters and in groups. In other words there is a real, and highly significant, difference between the galaxian content of groups and clusters. On the other hand K-S tests of the data in Tables 4 and 5 show that the distributions of morphological types, and of the colors of galaxies in groups and in the field, do not differ at a respectable level of statistical significance. This suggests that groups of galaxies (such as the Local Group) have galaxian populations that resemble those of isolated field galaxies. In other words groups appear to be density enhancements within the field. It is also interesting to note that the study of the Hubble morphological types of galaxies, and investigations of the intrinsic colors of galaxies yield almost identical results. In other words it is not possible to say if galaxy color provides a more significant way of characterizing a galaxy than does its morphological type.

7. CONCLUSIONS

Large-scale photographs of all non-dwarf early-type galaxies in The Shapley-Ames Catalog, for which $(U - B)_o$ colors are available, have been carefully inspected to search for possible morphological discontinuities between objects that lie on the relatively narrow red sequence and the broader blue sequence in the galaxian color-luminosity diagram. Furthermore all of these objects were graded on the basis of their dust content and apparent rate of star formation. Finally the environments of all Shapley-Ames galaxies with $\delta > -27^\circ$ were inspected on the prints of the Palomar Sky Survey to see if they appeared to belong to clusters, to groups, or to the general field.

7.1. Red and blue sequences.

Careful inspection of the morphologies of all of the Shapley-Ames galaxies listed in Table 1 strongly suggests that: (1) the strengths of central bulges decrease smoothly towards later types and bluer colors while, (2) the strength of the disk component increases gradually towards later Hubble types and bluer colors. In other words there appears to be no obvious dichotomy between the morphologies of galaxies that are situated on the broad blue and on the narrow red sequences in the galaxian color-magnitude diagram. Large deviations from the average relationships between the colors and the morphological types of galaxies are often found to be indicative of an unusual evolutionary histories.

7.2. Galaxy colors and environments.

Both the colors and morphological types of galaxies are seen to correlate strongly with their environments, with galaxies on the red sequence being dominant in clusters and objects on the blue sequence predominating in general field. Interestingly galaxies located in groups (such as the Local Group) are found to have colors and morphologies resembling field galaxies. In other words groups appear to be condensations within the field, rather than close relatives of clusters. Perhaps this is what Hubble (1936,p.126) meant when he wrote that the Local Group was “[A] typical, small group of nebulae which is isolated in the general field.”

7.3. Dust and star formation.

Inspection of the information for 404 early-type galaxies having estimates of both dustiness and intensity of star formation strongly confirms Walter Baade’s conclusion about the close correlation between the presence of dust and star formation. A few dusty galaxies, with no obvious star formation, are probably objects that have had an unusual evolutionary history.

7.4. Normal and barred galaxies.

No systematic color differences were found between S0 and SB0, Sa and SBa, Sb and SBb and Sc and SBc galaxies. This shows that the presence or absence of a bar does not strongly affect the stellar evolutionary history of a galaxy. The reason for this may be that a bar merely rearranges material in the disk without profoundly affecting its evolution.

7.5. Properties of S0 galaxies.

Surprisingly the relative frequency of $S0_1$, $S0_2$ and $S0_3$ galaxies does not appear to differ significantly between cluster, group and field regions.

7.6. Dust and galaxy colors

The presence/absence of obvious signs of star formation and the presence/absence of dust affect the $(U - B)_0$ colors of galaxies in the expected way.

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Table 1. Catalog of Shapley-Ames galaxies with $M_B < -18.0$ for which de Vaucoulers et al. (1991) list integrated $(U - B)_o$ colors.

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N0016	R	SB0 1	-21.54	+0.37	C	0	0
N0024	B	Sc II-III	-18.39	-0.17	F		
N0055	B	Sc	-19.42	0.00	...		
N0095	B	Sc II	-21.43	-0.05	F		
N0128	R	S0 2 p	-21.38	+0.53	G	0	0
N0134	B	Sbc II-III:	-21.55	+0.11	...		
N0151	B	SBbc II	-21.97	+0.04	F		
N0148	R	S0 2	-19.15	+0.46	...	0	0
N0150	B	Sbc II	-20.58	-0.05	...		
N0157	B	Sc I-II	-21.46	-0.07	F		
N0175	B	SBab I-II	-21.44	+0.09	F	1	2:
N0178	B	Sc IV	-19.17	-0.42	F		
N0210	B	Sb I	-21.13	+0.03	F	1	2
N0214	B	Sc I	-21.68	+0.07	F		
N0224	R	Sb I-II	-21.61	+0.34:	G	2	2
N0227	R	E5	-21.12	+0.45	C	0	0
N0254	R	S0/Sa	-18.93	+0.36	...	2	1
N0255	B	SBc II-III	-19.93	-0.28	F		
N0268	B	SBc I-II	-21.64	-0.26	F		
N0278	B	Sbc II	-19.77	-0.15:	F		
N0289	B	SBbc I-II	-20.68	+0.08	...		
N0309	B	Sc I	-22.52	-0.13	F		
N0337	B	Sc II	-20.34	-0.18	F		
N0357	R	SBa	-20.32	+0.59	C	0	1:
New 1	B	SBc II	-19.12	+0.06	F		
N0406	B	Sc II	-19.56	-0.18	...		
N0434	R	Sab	-21.94	+0.27	...	2	1
N0428	B	Sc III	-19.88	-0.22	F		
N0470	B	Sbc II-III	-20.73	+0.04	G		
N0473	B	Sb	-19.98	+0.12	F	1	2
N0474	R	S0/Sa	-20.46	+0.38	G	0	1:
N0491	B	SBbc II	-20.87	-0.27	...		
N0488	R	Sab I	-22.13	+0.30	F	1	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N0520	B	Amorph	-20.57	+0.11	F		
N0521	B	SBc I	-22.15	+0.19	G		
N0524	R	S0/Sa	-21.20	+0.58	C	0	1
N0533	R	E3	-21.79	+0.57	G	0	0
N0584	R	S0 1	-21.07	+0.47	C	0	0
N0596	R	E0	-20.42	+0.40	C	0	0
N0598	B	Sc II-III	-19.07	-0.16	G		
N0613	B	SBb II	-21.51	+0.03	...		
N0615	B	Sb I-II	-20.86	+0.18	C	1	2
N0636	R	E1	-20.01	+0.46	C	0	0
N0670	B	Sb:	-21.61	+0.17	F	1	1
N0672	B	SBc III	-19.14	-0.21	F		
N0685	B	SBc II	-19.66	-0.19	...		
N0681	R	Sab	-20.06	+0.23	G	3	1
N0701	B	Sc III	-19.83	-0.07	G		
N0720	R	E5	-20.87	+0.48	F	0	0
N0718	R	Sa I	-19.73	+0.35	F	0	1
N0753	B	Sc I	-21.94	-0.08	C		
N0782	B	SBb I-II	-22.26	+0.03	...		
N0772	B	Sb I	-22.56	+0.18	F	2	2
N0779	B	Sb I-II	-20.84	+0.11	F	1	1
N0777	R	E1	-22.15	+0.59	C	0	0
N0788	R	Sa	-20.91	+0.42	F	0	1
I1783	B	Sbc II	-20.71	-0.03	...		
I1788	B	Sbc II:	-20.88	+0.01	...		
N0877	B	Sc I-II	-21.77	-0.07	F		
N0890	R	S0 1	-21.67	+0.46	F	0	0
N0895	B	Sc I	-20.74	-0.09	F		
N0891	B	Sb	-20.93	+0.08	F	2	1
N0908	B	Sc I-II	-21.42	-0.06	F		
N0922	B	Sc IIp	-20.96	-0.43	F		
N0936	R	SB0/SBa	-20.48	+0.55	G	0	0
N0941	B	Scd III	-19.39	-0.16	G		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N0949	B	Sc III	-18.55	-0.09	F		
N0955	R	Sb	-20.01	+0.23	G	1	1
N0958	B	Sbc II	-22.30	+0.08	F		
N0976	B	Sbc I-II	-21.28	+0.05	G		
N0972	B	Sb p	-20.83	+0.09	F	3	1
N0986	B	SBb I-II	-21.08	+0.05	...		
N1022	R	SBa p	-20.10	+0.22	C	1	1
N1042	B	Sc I-II	-20.42	-0.12	...		
N1052	R	E3/S0	-20.18	+0.42	C	0	0
N1055	B	Sbc II	-20.19	+0.09	G		
N1068	B	Sb II	-22.20	+0.06	G	3	2
N1073	B	SBc II	-20.17	-0.12	G		
N1079	R	Sa	-20.29	+0.41	...	1	1
N1084	B	Sc II	-20.89	-0.14	C		
N1087	B	Sc III-IV	-20.70	-0.12	G		
N1090	B	SBc I-II	-21.01	+0.03	G		
N1097	B	SBbc I-II	-21.57	+0.19	...		
N1140	B	Sb p	-19.63	-0.50	G		
N1172	R	S0 1	-18.75	+0.28	C	0	0
N1179	B	SBc I-II	-20.15	-0.10	F		
N1187	B	SBc I-II	-20.97	-0.08	F		
N1175	R	S0 2	-21.15	+0.41:	F	0	0
N1199	R	E2	-20.50	+0.44	C	0	0
N1201	R	S0 1	-20.36	+0.51	F	0	0
N1209	R	E6	-20.63	+0.50	C	0	0
N1232	B	Sc I	-21.84	-0.02	F	1	3
N1249	B	SBc II	-19.25	-0.26	...		
N1241	B	SBbc I	-21.61	-0.02	F		
N1255	B	Sc II	-20.69	-0.17	F		
N1288	B	Sab I-II	-21.69	+0.02	...	2	3
N1291	R	SBa	-20.95	+0.45	...	0	1
N1275	B	Ep	-22.54	-0.03:	...	1	1
N1300	B	SBb I	-21.26	+0.06	F	1	2

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N1302	R	Sa	-20.50	+0.35	F	1	1
N1309	B	Sb II	-20.88	-0.20	F		
N1316	R	Sa p	-22.35	+0.39	...	2	0
N1317	R	Sa	-19.63	+0.28	...	1	2
N1325	B	Sb	-20.42	+0.01	G	1	2
N1332	R	S0 1	-20.30	+0.56	G	0	0
N1337	B	Sc I-II	-19.79	-0.01	F		
N1341	B	SBc II-III	-18.78	-0.10	...		
N1339	R	E4	-18.83	+0.49	...	0	0
N1344	R	S0 1	-19.89	+0.45	...	0	0
N1350	R	Sa	-20.65	+0.29	...	2	2
N1353	R	Sbc II	-20.02	+0.28	G		
I1954	B	Sc II	-19.04	-0.11	...		
N1357	R	Sa	-20.40	+0.20	F	2	2
N1358	R	SBa I	-20.90	+0.40	G	1	2
N1359	B	Sc II-III	-19.99	-0.51	F		
N1365	B	SBb I	-22.22	+0.11	...	2	2
N1371	R	Sa	-20.03	+0.45	F	1	2
N1374	R	E0	-19.37	+0.47	...		
N1379	R	E0	-19.60	+0.38	...	0	0
N1380	R	S0/Sa	-20.57	+0.43	...	0	1
N1381	R	S0 1	-19.33	+0.42	...	0	0
N1386	R	Sa	-20.63	+0.28	...	2	0
N1387	R	SB0 2 p	-19.84	+0.51	...	0	0
N1389	R	S0/SB0 1	-19.28	+0.38	...	0	0
N1385	B	Sc III:	-21.04	-0.21	F		
N1395	R	E2	-20.70	+0.58	C	0	0
N1399	R	E1	-20.88	+0.51	...	0	0
N1398	R	SBab I	-21.57	+0.41	F	1	2
N1404	R	E2	-20.61	+0.57	...	0	0
N1411	R	S0 2	-18.93	+0.38	...	0	0
N1406	B	Sc II:	-19.00	-0.10	...		
N1415	R	Sa/SBa	-19.89	+0.32	C	2	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N1417	B	Sb I-II	-21.84	+0.06	G	1	2
N1421	B	Sc III:	-21.23	-0.16	F		
N1425	B	Sb II	-20.80	+0.05	...	1	2
N1427	R	E5	-19.73	+0.43	...		
N1433	R	SBb I-II	-20.42	+0.20	...		
N1426	R	E4	-19.14	+0.43	C		
N1437	R	Sc II	-19.49	+0.15	...		
N1439	R	E1	-19.26	+0.38	C		
N1440	R	S0/SB0 1	-19.02	+0.56	C	0	1
N1448	B	Sc II:	-20.41	-0.10	...		
N1452	R	SBa	-19.12	+0.53	C	0	1
N1453	R	E2	-21.18	+0.57	G	0	0
N1461	R	S0 2	-18.71	+0.50	...	0	0
I2006	R	E1	-19.40	+0.40	...	0	0
N1487	B	Sp	-18.28	-0.34	...		
N1511	B	Sc p	-19.75	-0.14	...		
N1507	B	Sc	-18.66	-0.24	F		
N1512	B:	SBb I p	-19.41	+0.14	...		
N1515	R	Sb II	-20.03	+0.18	...	2	1
N1518	B	Sc III	-18.89	-0.33	F		
N1521	R	E3	-21.30	+0.50	F	0	0
N1527	R	S0 2	-18.86	+0.50	...	0	0
I2035	R	SB0 1 p	-19.23	+0.29	...	0	0
N1536	B	SBc p	-18.41	-0.07	...		
N1532	B	Sab I	-20.60	+0.05	...		
N1537	R	E6	-19.70	+0.42	...	0	0
N1543	R	S0/Sa	-19.76	+0.53	...	0	1
N1546	R	Sbc III	-18.92	+0.32	...		
N1549	R	E2	-20.06	+0.51	...	0	0
N1553	R	S0 1/2 p	-20.53	+0.47	...	0	0
N1559	B	SBc III	-20.53	-0.12	...		
N1566	B	Sc I	-21.56	-0.06	...		
N1574	R	SB0 2	-18.87	+0.51	...	0	0

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N1596	R	S0 1	-19.37	+0.41	...	0	0
N1600	R	E4	-22.14	+0.55	C		
N1617	R	Sa	-19.95	+0.44	...	2	1
N1625	B	Sb/Sc	-20.86	-0.21	F		
N1637	B	SBc II-III	-18.99	+0.01	F		
N1638	R	Sa	-20.73	+0.30	F	1	0
N1640	B	SBbc I-II	-19.84	+0.10	F		
N1659	B	Sc II-III	-21.35	-0.09	G		
N1672	B	Sb II	-20.64	-0.01	...	2	3
N1667	B	Sc: II p	-21.81	-0.05	F		
N1700	R	E3	-21.94	+0.49	G	0	0
N1744	B	SBcd II-III	-18.67	-0.17	F		
N1784	B	SBbc I-II	-20.72	+0.10	F		
N1792	B	Sc II	-20.66	+0.02	...		
N1808	R	Sbc p	-20.23	+0.24	...		
A0509	B	Sc II	-20.15	-0.03	F		
N1832	B	SBb I	-20.80	-0.08	F		
N1947	R	S0 3 p	-19.15	+0.46	...	2	0
N1964	B	Sb I-II	-21.28	+0.13	...		
N2082	B	Sc II-III	-18.39	-0.13	...		
N2090	B	Sc II	-18.99	+0.12	...		
N2179	R	Sa	-20.04	+0.28:	F	0	1
N2188	B	Scd III	-18.13	-0.37:	...		
N2196	B	Sab I	-21.22	+0.10:	F	2	2
N2146	R	Sb II p	-20.63	+0.19:	F	3	1
N2217	R	SBa	-20.50	+0.51:	F	1	1
N2280	B	Sc I	-20.90	-0.04:	...		
N2310	R	S0 2/3	-18.58	+0.30:	...	0	0
N2268	B	Sbc II	-21.10	-0.03	G		
N2314	R	E3	-21.00	+0.51	F	0	0
N2339	B	SBc II	-21.10	-0.03:	F		
N2276	B	Sc II-III	-21.36	-0.14	G		
N2347	B	Sb I-II	-21.59	+0.10	F		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N2300	R	E3	-20.49	+0.64	G	0	0
N2369	R	Sbc I p	-21.40	+0.23:	...		
N2336	B	SBbc I	-22.21	-0.01	F	1	2
N2397	B	Sc III	-18.67	-0.10:	...		
N2434	R	E0	-18.95	+0.32:	...	0	0
N2427	B	Sc II-III	-18.74	-0.35:	...		
N2442	B	SBbc II	-18.47	+0.09:	...		
N2460	R	Sab	-19.89	+0.28	F	?	2
N2525	B	SBc II	-20.19	-0.05:	F	1	2
N2523	B	SBb I	-21.72	+0.13:	C		
N2541	B	Sc III	-18.20	-0.30	F		
N2545	B	SBc I-II	-20.81	+0.13	C		
N2549	R	S0 1/2	-19.12	+0.42	F	0	0
N2613	B	Sb II:	-21.98	+0.19:	F	2	1
N2608	B	Sbc II	-20.15	+0.03	F		
N2642	B	SBb I-II	-22.04	+0.01:	F		
N2639	R	Sa	-21.45	+0.28	F	1	1
N2654	R	Sab:	-20.26	+0.32	F	1	1
N2672	R	E2	-21.22	+0.63	C	0	0
N2655	R	Sa p	-21.46	+0.42	G		
N2683	B	Sb	-19.44	+0.14	F	1	1
N2681	R	Sa	-19.75	+0.29	F	1	1
N2685	R	S0 3 p	-18.92	+0.29	F	2	2
N2693	R	E2	-21.59	+0.62	C	0	0
N2713	R	Sbc I	-21.74	+0.36	F		
N2701	B	Sc II-III	-20.39	-0.18	F		
N2712	B	SBc I	-20.27	+0.01	F		
N2715	B	Sc II	-20.48	-0.16	G		
N2742	B	Sc II	-19.81	+0.00	F		
N2763	B	Sc II	-19.73	-0.11:	F		
N2764	R	Amorph/Sb p	-19.56	+0.20	F	3	1
N2732	R	S0 1	-19.89	+0.48	F	0	0
N2775	R	Sa	-20.03	+0.33	F	0	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N2768	R	S0 1/2	-20.78	+0.43	G	0	0
N2776	B	Sc I	-21.07	-0.09	F		
N2781	R	Sa	-20.02	+0.32:	F	1	1
N2784	R	S0	-18.18	+0.50:	F	0	0
N2782	B	Sa p	-21.33	-0.02	C	2	2
N2811	R	Sa	-21.02	+0.48:	F	1	1
N2815	R	Sb I-II	-21.27	+0.25:	F	2	2
N2798*	B	SBa	-19.08	-0.07	G	2	?
N2787	R	SB0/a	-18.71	+0.60	F	0	0:
N2835	B	SBc I	-19.50	-0.22:	F		
N2832	R	E3	-22.59	+0.55	C	0	0
N2848	B	Sc II	-20.05	-0.17:	F		
N2841	R	Sb	-20.05	+0.27	F	2	2
N2855	R	Sa	-20.12	+0.43	F	2	1
N2865	R	E4	-20.64	+0.36:	F		
N2859	R	SB0 2	-20.03	+0.47	F	0	1:
N2888	R	E2	-19.08	+0.29:	...	0	0
N2889	B	Sb II	-21.46	+0.05	G	2	3
N2880	R	SB0 1	-19.32	+0.43	F	0	0
N2903	B	Sc I-II	-20.23	+0.00	F		
N2907	R	S0 3 p	-19.25	+0.38:	G		
N2911	R	S0 p:	-19.63	+0.45	G	2	0
N2935	R	SBb I	-21.03	+0.29:	F		
N2955	B	Sc I	-21.60	+0.07	F		
N2962	R	SB0 2	-19.52	+0.51	F	0	0
N2950	R	SB0 2/3	-19.88	+0.48	F	0	0
N2967	B	Sc I-II	-20.44	+0.03	F		
N2964	B	Sc II	-19.80	-0.08	F		
N2974	R	E4	-20.39	+0.55	F	0	0
N2968	R	Amorph/S0 p	-19.00	+0.61	F		
N2983	R	SBa	-19.62	+0.48	F	0	0:
N2986	R	E2	-20.59	+0.56:	F	0	0
N2989	B	Sc I	-20.87	-0.16	F		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N2992	R	Sa	-20.63	+0.25	F	?	?
N2993	B	Sab	-19.73	-0.45	F	?	?
N2990	B	Sc II:	-20.53	-0.30	F		
N3001	B	SBbc I-II	-10.47	-0.06:	...		
N3003	B	Sc: III:	-20.18	-0.25	F		
N3038	B	Sb II	-20.71	+0.07:	...	2	2
N3032	B	S0/Sa	-19.09	+0.10	F	1	1
N3059	B	SBc III	-19.41	-0.21:	...	1	2
N3041	B	Scd	-19.57	-0.32	F		
N3067	B	Sb III	-19.79	+0.01	F	1	2
N3078	R	E3	-20.58	+0.56:	G		
N3087	R	E2	-20.12	+0.43:	...	0	0
N3081	R	SBa	-19.94	+0.30	F	1	2
N3065	R	S0 2	-19.66	+0.47	F	0	0
N3079	B	S p:	-20.91	-0.09	F		
I2537	B	Sc I-II	-20.50	0.00:	F		
N3115	R	S0 1	-19.09	+0.50	F	0	0
N3124	B	SBbc I	-21.50	+0.04	F		
N3136	R	E4	-20.09	+0.32:	...		
N3145	B	SBbc I	-21.71	+0.17	G	1	2
N3158	R	E3	-22.11	+0.59	C		
N3166	R	Sa	-20.46	+0.35	F	2	0
N3169	R	Sb I-II	-20.36	+0.23	F	3	2
N3175	R	Sc p III:	-18.79	+0.14:	...		
N3177	B	Sb II	-18.76	+0.04	C	0	2
N3184	B	Sc II	-19.55	-0.04	F		
N3190	R	Sa	-20.46	+0.37	C	3	1
N3193	R	E2	-19.53	+0.45	C	0	0
N3200	B	Sb I	-22.22	+0.10	F		
N3198	B	Sc I-II	-19.66	-0.10	F		
N3203	R	S0 2	-19.78	+0.32:	F	0	0
N3223	B	Sb I-II	-21.96	+0.12:	...	2	2
N3227	R	Sb III	-20.07	+0.24	F	1	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N3250	R	E3	-21.03	+0.53:	...	0	0
N3256	B	Sb p	-22.07	-0.22:	...	2	1
N3254	B	Sb II	-20.02	0.00:	G	1	2
N3258	R	E1	-20.33	+0.49:	...	0	0
N3268	R	E2	-20.20	+0.50:	...	0	0
N3271	R	Sa	-21.79	+0.52:	...	0	0
N3277	R	Sa I-II	-19.14	+0.22	G	0	1
N3285	R	Sab	...	+0.34	C:	2	1
N3301	R	Sa	-19.01	+0.29	F	0	1
N3318	B	SBbc II	-20.76	-0.13:	...		
N3310	B	Sbc p	-20.09	-0.45	F		
N3338	B	Sb I-II	-20.23	-0.05	C		
N3347	B	SBb I	-21.58	+0.20:	...		
N3344	B	SBbc I	-19.58	-0.08	F		
N3358	R	Sa I	-20.96	+0.31:	...	2	2
N3351	B	SBb II	-19.93	+0.14	C		
N3359	B	SBc p II	-20.57	-0.24	F		
N3348	R	E0	-21.10	+0.44	F	0	0
N3367	B	SBc II	-21.35	-0.19	F		
N3368	R	Sab II	-20.68	+0.27	C	2	2
N3377	R	E6	-18.53	+0.30	C	0	0
N3379	R	E0	-19.85	+0.52	C	0	0
N3384	R	SB0 1	-19.10	+0.41	C	0	0
N3390	R	S0 3	-19.92	+0.15:	...	2	1:
N3389	B	Sc II	-19.18	-0.22	C		
N3395	B	Sc II-III	-19.85	-0.28	G		
N3412	R	SB0 1/2	-18.62	+0.36	C	0	0
N3414	R	S0 1	-21.71	+0.54	G	0	0
N3415*	R	E5	-20.55	+0.20	F	?	?
N3430	B	Sbc I-II	-20.05	+0.07	G		
N3445	B	Sc III	-19.88	-0.31	C		
N3448	B	Amorph	-19.47	-0.24	F		
N3464	B	Sc I	-21.23	-0.12	F		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N3478	B	Sc	-22.54	+0.10	G		
N3489	R	S0/Sa	-18.27	+0.31	C	1	0:
N3486	B	Sc I-II	-19.32	-0.18	G	1	2
N3511	B	Sc III	-19.83	-0.19	F		
N3521	B	Sb II-III	-20.92	+0.16	F		
N3516	B	SB0 2	-20.70	-0.08	F	0	1
N3547	B	Sc III	-18.84	-0.22	F		
I2627	B	Sc I-II	-19.87	-0.06	F		
N3557	R	E3	-21.82	+0.49:	...	0	0
N3549	B	Sc II	-21.06	+0.14	F		
N3556	B	Sc III	-20.29	-0.02	C		
N3585	R	E1/S0	-20.38	+0.46	F	0	0
N3593	R	Sa p	-18.46	+0.25	G		
N3607	R	S0 3	-19.29	+0.46	C	2	0
N3608	R	E1	-19.11	+0.40	C	0	0
N3611	B	Sa	-19.30	-0.03	F	1:	2
N3610	R	E5	-20.60	+0.47	C	0	0
N3621	B	Sc III	-19.56	-0.19	...		
N3623	R	Sa II	-20.75	+0.35	G	2	1
N3626	R	Sa	-20.08	+0.28	C	2	2
N3627	B	Sb II	-20.75	+0.14	G	2	2
N3640	R	E2	-19.87	+0.51	G		
N3646	B	Sbc II	-22.40	-0.07	F		
N3655	B	Sc III p	-19.60	+0.03	C		
N3666	R	Sc II-III	-18.95	+0.28	G		
N3664	B	SBm III-IV	-18.66	-0.31	F		
N3665	R	S0 3	-20.54	+0.47	F	2	2
N3689	B	Sc II	-20.31	-0.05	G		
N3706	R	E4	-21.04	+0.48:	...	0	0
N3705	B	Sab I-II	-19.59	+0.05	F	1	2
N3717	R	Sb	-20.84	+0.24	...	2	1
N3720	B	Sbc I	-21.21	-0.05	F		
N3718	R	Sa p:	-20.51	+0.24	C		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N3732	B	Sc p	-19.30	-0.17	C		
N3810	B	Sc II	-19.49	-0.12	F		
N3813	B	Sc III	-19.82	-0.13	F		
N3877	B	Sc II	-19.62	+0.10	C		
N3885	R	Sa	-19.37	+0.16	...	2	1
N3888	B	Sc I-II	-20.00	-0.11	C		
N3898	R	Sa I	-20.31	+0.36	C	1	1
N3904	R	E2	-19.57	+0.49	...		
N3917	B	Sc III	-19.21	-0.02	C		
N3923	R	E4/S0	-20.88	+0.56	...	0	0
N3938	B	Sc I	-19.81	-0.11	C		
N3941	R	SB0/SBa	-19.37	+0.43	F	0	0
N3945	R	SB0 2	-19.92	+0.51	C		
N3952	B	S:	-18.57	-0.32	G		
N3953	B	SBbc I-II	-20.57	+0.14	C		
N3955	B	S p	-19.22	-0.11	F	0	1
N3962	R	E1	-20.16	+0.50	F	0	0
N3963	B	SBc I-II	-21.29	-0.03	C		
N3992	B	SBb I	-21.10	+0.16	C		
N3995	B	Sc III	-21.20	-0.49	G		
N3998	R	S0 1	-19.70	+0.52	C	0	0
N4008	R	S0 1	-20.61	+0.26	G		
N4013	R	Sbc:	-19.29	+0.18	C		
I0749	B	SBc II-II	-18.96	-0.06	F		
I0750	R	Sb:	-18.04	+0.29	F		
N4027	B	Sc III	-20.33	-0.07	C		
N4030	B	Sbc I	-20.69	+0.07	F		
N4032	B	Sb:	-18.65	-0.12	F		
N4036	R	S0/Sa	-20.11	+0.53	C	1	0
N4041	B	Sc II-III	-20.10	-0.09	C		
N4045	R	Sbc I-II	-19.75	+0.24	C		
N4050	R	SBb I-II	-20.30	+0.28	F		
N4062	B	Sc II-III	-18.71	0.00	F		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N4064	B	SBc:	-19.27	+0.10	C		
N4088	B	Sc/SBc II-III	-18.80	-0.11	C		
N4096	B	Sc II-III	-19.42	-0.07	C		
N4100	B	Sc I-II	-20.09	-0.01	C		
N4105	R	S0 1/2	-20.07	+0.44	...	0	0
N4106	R	SB0/SBa	-19.93	+0.45	...	0	0
N4111	R	S0 1	-18.60	+0.35	C	0	1:
N4125	R	E6	-20.92	+0.49	C	1:	0
N4124	R	S0 3	-18.62	+0.21	C	0	1:
N4123	B	SBbc	-19.62	-0.03	C	1	2
N4128	R	S0 1	-20.08	+0.46	F	0	0
N4129	B	Sc III:	-18.30	-0.24	F		
N4138	R	Sab	-19.48	+0.28	C	2	1
N4145	B	SBc II	-19.72	-0.12	F		
N4151	B	Sab	-20.20	-0.19	F	1	1
N4152	B	Sc I-II	-20.20	-0.10	C		
N4157	R	Sbc	-19.70	+0.21	C		
N4162	B	Sc I-II	-19.96	-0.06	F		
N4168	R	E2	-18.76	+0.49	C		
N4178	B	SBc II	-19.71	-0.08	C		
N4179	R	S0 1	-19.15	+0.41	C	0	0
N4183	B	Scd	-19.17	-0.13	...		
N4192	B	Sb II:	-21.12	+0.18	C	3	2
N4203	R	S0 2	-19.31	+0.52	F	0	0
N4212	B	Sc II-III	-19.53	-0.02	C		
N4216	R	Sb	-21.21	+0.38	C	2	1
N4217	R	Sb:	-20.73	+0.27	...		
N4215	R	S0 1	-19.18	+0.32	C	0	1:
N4220	R	Sa	-19.63	+0.27	C	2	2
N4219	B	Sbc II-III:	-20.53	-0.01:	...		
N4233	R	SB0 1	-18.00	+0.50	C	0	0
N4234	B	SBc III-IV	-19.13	-0.20	C		
N4235	R	Sa	-20.66	+0.23	C	2	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N4245	R	SBa	-18.18	+0.44	C	0	1:
N4251	R	S0 1	-19.09	+0.39	C	0	0
N4254	B	Sc I-II	-20.86	-0.03	C		
N4260	R	SBa	-19.76	+0.42	C	2	1
N4261	R	E3	-20.98	+0.53	C	0	0
N4262	R	SB0 2/3	-18.59	+0.49	C	0	0
N4267	R	SB0 1	-19.19	+0.57	C	0	0
N4270	R	S0 1	-19.31	+0.40	C	0	0
N4274	R	Sa	-20.14	+0.34	C	2	2
N4278	R	E1	-18.51	+0.43	C	0	0
N4294	B	SBc II-III	-18.95	-0.30	C		
N4299	B	Sd III	-18.41	-0.35	C		
N4303	B	Sc I	-21.11	-0.12	C		
N4314	R	SBa p	-19.07	+0.26	C	0	1
N4321	B	Sc I	-21.18	-0.04	C		
N4324	R	Sa	-19.06	+0.30	C	0	1
N4339	R	S0 1/2	-18.65	+0.50	C	0	0
N4340	R	SB0 2	-19.04	+0.48	C	0	?
N4348	R	S	-20.28	+0.21	C		
N4350	R	S0 1	-19.09	+0.44	C	0	0
N4365	R	E3	-20.37	+0.51	C	0	0
N4369	B	Sc III-IV	-18.93	-0.02	F		
N4386	R	S0 1	-19.75	+0.46	C	0	0
N4371	R	SB0 2/3	-19.23	+0.52	C	0	0
N4374	R	E1	-20.74	+0.50	C	0	0
N4373	R	E	-21.41	+0.36:	...	0	0
N4377	R	S0 1	-18.30	+0.33	C		
N4379	R	S0 2	-18.67	+0.41	C	0	0
N4378	R	Sa	-20.39	+0.45	C	0	1
N4380	B	Sab	-19.31	+0.07	C	1	2
N4382	R	S0 1 p	-20.87	+0.40	C		
N4385	B	SBbc II	-19.65	0.00	C	1	3
N4388	B	Sab	-20.32	+0.02	C	2	1

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N4394	R	SBb I-II	-19.69	+0.20	C		
N4406	R	S0/E3	-20.95	+0.46	C	0	0
N4414	B	Sc II	-19.53	+0.11	C		
N4417	R	S0 1	-18.90	+0.39	C	0	0
N4419	R	SBab:	-19.85	+0.24	C	3	2
N4425	R	SB0/Sa p	-18.18	+0.31	C	0	1
N4429	R	S0/Sa p	-19.82	+0.49	C	2	1
I3370	R	E2 p	-21.01	+0.35:	...	0	0
N4433	B	Sb III	-20.54	-0.18	C		
N4435	R	SB0 1	-19.25	+0.46	C	0	0
N4438	R	Sb	-21.00	+0.26	C		
N4442	R	SB0 1	-19.66	+0.54	C		
N4448	R	Sb I-II	-18.81	+0.29	C	1	2
N4449	B	Sm IV	-18.11	-0.38	C		
N4454	R	Sa	-19.52	+0.22	C	1	2
N4457	R	Sb II	-19.85	+0.25	C	2	2
N4459	R	S0 3	-19.48	+0.46	C	0	0
N4461	R	Sa	-18.88	+0.41	C	1	0
N4472	R	E1/S0	-21.65	+0.56	C	1	0
N4473	R	E5	-19.90	+0.44	C	0	0
N4474	R	S0 1	-18.27	+0.30	C	0	0
N4477	R	SB0/SBa	-19.73	+0.60	C	0	0
N4478	R	E2	-18.82	+0.45	C	0	0
N4485	B	S	-18.49	-0.25	C		
N4490	B	Scd III p	-19.97	-0.23	C		
N4486	R	E0	-21.35	+0.55	C	0	0
N4494	R	E1	-19.10	+0.44	F	0	0
N4501	B	Sbc II	-21.20	+0.17	C		
N4503	R	Sa	-18.75	+0.60	C	0	0
N4519	B	SBc II	-19.03	+0.01	C		
N4526	R	S0 3	-20.38	+0.48	C	0	0
N4527	B	Sb II	-21.46	+0.11	C	2	2
N4536	B	Sc I	-21.42	-0.08	C		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N4507	B	SBab I	-21.23	+0.01:	...		
N4546	R	SB0/Sa	-19.12	+0.56	C	0	0
N4548	R	SBb I-II	-20.54	+0.26	C		
N4550	R	E7/S0	-18.64	+0.33	C	0	0
N4552	R	S0 1	-20.17	+0.53	C	0	0
N4561	B	SBc IV	-18.35	-0.46	C		
N4564	R	E6	-19.10	+0.45	C		
N4567	R	Sc II-III	-19.30	+0.15	C		
N4569	R	Sab I-II	-21.58	+0.23	C	3	2
N4570	R	S0/E7	-19.29	+0.44	C	0	0
N4578	R	S0 1/2	-18.93	+0.34	C	0	0
N4579	R	Sab II	-20.96	+0.27	C	2	2
N4594	R	Sab	-22.08	+0.43	C	2	1
N4618	B	SBbc II p	-18.66	-0.21	C		
N4621	R	E5	-20.30	+0.47	C	0	0
N4638	R	S0 1	-18.92	+0.42	C		
N4636	R	E0/S0	-19.85	+0.43	C	0	0
N4639	B	SBb II	-19.40	+0.04	C		
N4643	R	SB0/SBa	-19.75	+0.56	C	0	1
N4647	R	Sc III	-19.31	+0.26	C	2	2
N4654	B	SBs II	-20.29	-0.13	C		
N4660	R	E5	-19.10	+0.43	C	0	0
N4658	B	SBc I-II	-20.32	-0.14	C		
N4670	B	SB p	-18.28	-0.50	C		
N4691	B	SBb p	-19.49	-0.08	C		
N4694	R	Amorph	-18.76	+0.20	C		
N4698	R	Sa	-19.82	+0.40	C	1	1
N4697	R	E6	-20.74	+0.39	C	0	0
N4699	R	Sab	-21.51	+0.30	C	1	1
N4701	B	Sbc II	-18.16	-0.24	C		
N4710	R	S0 3	-18.92	+0.30	C	2	1:
N4713	B	SBc II-III	-19.19	-0.20	C		
N4731	B	SBc III:	-20.33	-0.25	C		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N4736	B	Sab	-20.08	+0.14	C	2	2
N4742	R	E4	-18.90	+0.29	C	0	0
N4754	R	SB0 1	-19.56	+0.45	C	0	0
N4753	R	S0 p	-20.17	+0.36	C	2	0
N4756	R	E3	-19.47	+0.43	C		
N4762	R	S0 1	-19.71	+0.34	C		
N4772	R	Sa:	-18.93	+0.28	C		
N4808	B	Sc III	-20.68	-0.10	C		
N4818	R	Sab:	-19.51	+0.17	C		
N4845	R	Sa	-19.49	+0.31	C		
N4866	R	Sa	-20.38	+0.40	C	2	1:
N4889	R	E4	-22.26	+0.54	C	0	0
N4902	B	SBb I-II	-21.31	+0.04	G		
N4914	R	S0: 1	-21.31	+0.49	F	0	0
N4904	B	SBbc II-III	-18.74	-0.09	C		
N4915	R	E0	-20.26	+0.44	F	0	0
N4939	B	Sbc I	-22.04	+0.07	C		
N4958	R	S0 1	-19.90	+0.36	C	0	0
N4976	R	S0 1	-20.22	+0.25:	...	0	0
N4984	R	Sa	-19.76	+0.33	F	2	1
N5005	R	Sb II	-21.05	+0.25	F	2	1
N5017	R	E2	-19.42	+0.40	C	0	0
N5018	R	E4	-21.26	+0.44	G	1:	0
N5037	R	Sab	-20.00	+0.30	C	3	1
N5054	B	Sb I-II	-19.94	+0.11	C	3	3
N5061	R	E0	-20.81	+0.38	G	0	0
N5074	B	S	-20.54	-0.48	G		
N5077	R	E3	-20.30	+0.57	C	1	0
N5085	B	Sc I-II	-20.31	+0.13	F		
N5084	R	S0 1	-19.72	+0.35	G	1	1
N5087	R	S0 3	-19.87	+0.45	G	0	1:
N5101	R	SBa	-20.33	+0.55	G	0	1
N5102	R	S0 1	-18.00	+0.18	...	0	0

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N5112	B	Sc II	-19.34	-0.29	F		
N5121	R	S0/Sa	-19.07	+0.30:	...	0	1
N5135	B	SBb:	-21.82	+0.06	...		
N5147	B	Sc III-IV	-18.74	-0.16	F		
N5150	B	Sb I-II	-21.13	+0.16	...		
N5161	B	Sc I	-21.16	-0.03	...	2	2
N5172	B	Sb I	-21.91	+0.02	F		
N5170	B	Sb:	-20.63	+0.12	F	2	1
N5195	R	SB0 1 p	-18.97	+0.30	C	2	?
N5188	B	SBb II-III p	-20.45	+0.09	...		
I4296	R	E0	-21.99	+0.55	...	0	0
N5236	B	SBc II	-20.39	0.00	...		
N5248	B	Sbc I-II	-20.46	+0.02	F		
N5247	B	Sc I-II	-20.36	-0.19	F		
N5273	R	S0/Sa	-18.50	+0.34	F	1	1
N5297	B	Sc II	-21.46	-0.05	G		
N5301	B	Sc	-20.10	+0.03	F		
N5322	R	E4	-21.31	+0.48	C	0	0
N5347	B	SBb I-II	-19.81	-0.05	G		
N5350	R	SBbc I-II	-20.75	+0.25	C		
N5353	R	S0/E7	-20.46	+0.58	C	0	0
N5371	B	SBb/SBb I	-22.05	+0.10	C	1	2
N5363	R	S0: 3	-19.77	+0.40	G		
N5364	B	Sc I	-20.42	+0.03	G		
N5377	R	SBa/Sa	-20.89	+0.33	F	1	1
N5365	R	SB0 1/3	-20.60	+0.56:	...	0	0
N5380	R	S0 1	-20.45	+0.42	C	0	0
N5383	B	SBb I-II	-21.06	+0.05	C		
N5395	B	Sb II	-21.96	+0.04	C	3	2
N5406	B	Sc I	-21.79	+0.15	C		
N5426	B	Sbc I	-20.45	-0.15	F		
N5427	B	Sbc I	-21.06	-0.19	F		
N5473	R	SB0 1	-20.07	+0.51	G	0	0

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N5468	B	Sc II	-20.98	-0.15	F		
N5464	B	IBm III	-19.92	-0.36	...		
N5485	R	S0 3 p	-19.06	+0.50	G	2	?
N5493	R	E7/S0	-20.45	+0.32	F	0	0
N5534	B	SBbc II	-19.78	-0.18	F		
N5548	B	Sa	-21.35	-0.13	F	1	1
N5557	R	E2	-21.35	+0.52	C	0	0
N5566	R	SBa II	-21.26	+0.34	G	1	1
N5574	R	S0 1	-18.56	+0.30	G		
N5576	R	E4	-19.78	+0.40	G	0	0
N5592	B	Sbc I-II	-21.15	-0.01	...		
N5600	B	Sb p	-19.82	-0.08	F		
N5595	B	Sc II	-20.62	-0.27	F		
N5614	R	Sa	-21.72	+0.40	C	2	1
N5631	R	S0/Sa	-19.94	+0.42	F	2	1
N5633	B	Sbc II	-20.27	-0.09	F		
N5638	R	E1	-19.58	+0.43	G	?	?
N5653	B	Sc III p	-20.99	-0.10	G		
N5660	B	Sc II	-20.72	-0.19	G		
N5645	B	Sc III p	-19.12	-0.14	F		
N5612	B	Sb II	-20.92	+0.18:	...		
N5643	B	SBc II-III	-20.47	+0.05:	...		
N5676	B	Sc II	-21.38	+0.01	G		
N5689	R	Sa	-20.12	+0.48	G	2	0
N5691	B	Sb/SBb III p	-19.61	-0.18	G		
N5701	R	SBa	-19.74	+0.25	F	0	1
N5713	B	Sbc p	-20.34	+0.01	G		
N5740	B	Sb I	-19.78	+0.05	F	2	2
N5746	R	Sb	-21.61	+0.24	F	2	1
N5750	R	SBa	-20.41	+0.22	F	2	1
N5756	B	Sc II	-19.70	-0.02	G		
N5775	B	Sc	-20.18	-0.08	G		
N5792	B	SBb I-II	-21.62	+0.09	F		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N5791	R	S0 1	-20.52	+0.47	G	0	0
N5796	R	E1 p	-20.44	+0.51	G	0	0
N5820	R	S0 2	-20.45	+0.50	F	0	0
N5813	R	E1	-20.48	+0.52	C	0	0
N5831	R	E4	-19.34	+0.55	C		
N5838	R	S0 2	-19.71	+0.57	C		
N5846	R	S0 1	-20.76	+0.45	C	0	0
N5850	B	SBb I-II	-21.50	+0.14	C		
N5866	R	S0 3	-19.49	+0.33	F	2	1
N5854	R	Sa	-19.27	+0.21	C	0	0
N5879	B	Sb II	-19.51	-0.12	F	1	2
N5885	B	SBc II	-20.34	-0.19	F		
N5899	B	Sc II	-20.89	+0.12	G		
N5898	R	S0 2/3	-19.97	+0.49	G	1	0
N5908	R	Sb	-21.55	+0.23	G	3	1
N5915	B	SBbc p	-20.02	-0.38	F		
N5921	B	SBbc I-II	-20.41	+0.01	F		
N5936	B	Sc I-II	-21.08	-0.11	F		
N5962	B	Sc II-III	-20.55	+0.01	G		
N5970	B	SBbc II	-20.64	+0.07	F		
N5982	R	E3	-21.16	+0.50	G	0	0
N5985	B	SBb I	-21.92	+0.09	G		
N5967	B	Sc II	-20.93	-0.07:	...		
N6015	B	Sc II-III	-19.75	-0.14	F		
N6052	B	S p	-20.96	-0.48	G		
N6070	B	Sc I	-20.49	-0.05	F		
N6106	B	Sc II-III	-19.37	-0.15	F		
N6118	B	Sc I-II	-20.47	-0.04	F		
N6181	B	Sc II	-20.83	-0.13	F		
N6217	B	SBbc II	-20.38	-0.22	F		
N6207	B	Sc III	-19.23	-0.24	F		
N6215	B	Sc II	-20.60	-0.44:	...		
N6221	B	Sbc II-III	-20.82	-0.01:	...		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N6239	B	SBc III p	-18.80	-0.24	F		
N6300	B	SBb II p	-20.59	+0.01:	...		
N6384	B	Sb I	-21.55	+0.12:	F	2	2
N6412	B	SBc/Sc I-II	-19.87	-0.14	F		
N6482	R	E2	-21.93	+0.29:	G	0	0
N6503	B	Sc III	-18.03	-0.06	F		
N6574	B	Sbc II-III	-20.58	-0.00:	F		
N6643	B	Sc II	-20.91	-0.13	F		
I4721	B	Sc II	-20.48	-0.10:	...		
N6684	R	SBa	-19.18	+0.36:	...	0	1
N6699	B	Sbc I	-21.18	-0.09:	...		
HA85-2	R	E3	-20.43	+0.42:	...		
N6721	R	E1	-21.02	+0.41:	...		
N6753	B	Sb I	-21.91	+0.05	...	1	2
N6758	R	E2	-20.89	+0.44	...	0	0
I4837	B	Sc II-III	-20.79	-0.26	...		
N6780	B	Sbc I-II	-20.78	+0.05	...		
N6776	R	E1 p	-21.65	+0.44	...		
N6808	B	Sc II	-20.71	-0.05	...		
N6810	B	Sb	-21.14	+0.15	...	3	2
N6814	B	Sbc I-II	-20.48	+0.12:	F		
I4889	R	S0 1/2	-20.63	+0.41	...	0	0
N6835	B	Amorph	-19.07	-0.03:	F		
N6851	R	E4	-19.62	+0.42	...	0	0
N6854	R	E1 + E0	-20.35	+0.42	...	0	0
N6861	R	S0 3	-21.04	+0.55	...	2	0
N6868	R	E3/S0	-21.19	+0.60	...		
N6875	R	S0/Sa	-20.52	+0.35	...		
N6887	B	Sab I-II	-20.69	+0.03	...	2	2
N6890	B	Sab II-III	-20.33	+0.10	...	1	2
N6893	R	S0 3	-20.79	+0.47	...	2	0
I4946*	R	SBa	-20.51	+0.20	...	1	1
N6902	B	Sa	-20.68	+0.04	...	1	2

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N6907	B	SBbc II	-21.76	-0.05	F		
N6909	R	E5	-20.18	+0.26	...	0	0
I5020	B	Sab	-19.87	+0.03	...		
N6923	B	SBbc II	-20.88	+0.06	...		
N6925	B	Sbc I	-21.64	+0.04	...		
N6935	B	Sa	-21.73	+0.16	...	0	2
N6943	B	Sbc I	-21.60	+0.02	...	2	2
I5039	B	Sc III:	-20.54	-0.31	...		
N6958	R	S0 1	-20.83	+0.45	...		
I5063	R	S0/Sa	-20.22	+0.36	...	2	1
N6970	B	Sc II	-21.48	-0.09	...		
N6984	B	SBbc II	-21.17	-0.22	...		
N7007	R	S0/Sa:	-20.14	+0.39	...	2	1:
N7014	R	E5	-20.87	+0.54	...	0	0
N7020	R	S0/Sa	-20.67	+0.43	...	0	1
N7029	R	S0 1	-20.47	+0.40	...	0	0
N7041	R	S0/E7	-20.13	+0.39	...	0	0
N7049	R	S0/Sa	-20.84	+0.57	...	2	1
New 6	B	Sc I	-21.07	-0.11	...		
I5105	R	E5	-21.80	+0.55	...	0	0
N7070	B	SBc III	-20.13	-0.17	...		
N7079	R	SBa	-20.50	+0.36	...	0	0
N7083	B	Sb I-II	-22.08	-0.04	...	2	3
N7090	B	SBc:	-19.98	-0.13	...		
N7096	R	Sa I	-20.50	+0.35	...	0	1
N7126	B	Sa:	-20.88	-0.06	...	1	2
N7137	B	Sc III	-19.69	-0.04:	F		
N7135	R	S0 1 p	-21.61	+0.42	...	0	1:
N7144	R	E0	-20.59	+0.43	...	0	0
N7145	R	E0	-20.00	+0.41	...	0	0
N7155	R	SB0	-19.30	+0.42	...	0	0
N7162	B	Sbc II	-19.81	-0.12	...		
N7166	R	S0 1	-19.94	+0.49	...	0	0

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N7177	B	Sab II	-20.37	+0.12	F	1	2
N7171	B	Sb I	-20.73	-0.05	F		
N7168	R	E3/S0	-20.18	+0.44	...	0	0
N7184	B	Sb II	-22.37	+0.10	F	1	2
I5156	B	Sb II-III	-19.67	+0.09	...		
N7196	R	E3/S0	-20.64	+0.49	...	0	0
N7192	R	S0 2	-20.82	+0.39	...	0	0
N7205	B	Sb III	-20.75	-0.10	...	3	3
N7217	R	Sb II-III	-20.93	+0.25:	F	2	1
N7213	R	Sa	-21.23	+0.34	...	1	1
I5181	R	S0 1	-19.89	+0.45	...	0	0
N7232	R	S0/Sb	-19.06	+0.31	...	2	?
I5179	B	Sc II-III	-21.29	-0.06	...		
N7252	R	Merger	-21.29	+0.21	F		
N7300	R	Sc I-II	-21.10	+0.20	G		
N7302	R	S0 1	-19.73	+0.44	G	0	0
N7307	B	SBc II	-20.12	-0.11	...		
N7309	B	Sc I-II	-21.09	+0.03	F		
N7314	B	Sc III	-20.53	-0.11	F		
N7331	B	Sb I-II	-21.87	+0.15:	F	2	2
N7332	R	S0 2/3	-20.05	+0.33	F	0	0
N7329	B	SBbc I-II	-21.35	+0.14	...		
I5240	R	SBa	-20.31	+0.31	...	0	1
N7361	B	Sc II-III:	-19.09	-0.35	...		
N7371	B	SBa II	-20.45	+0.10	F	1	2
N7377	R	S0/Sa p	-20.89	+0.41	F	1	0
N7392	B	Sbc I-II	-21.00	+0.08	F		
N7410	R	SBa	-21.67	+0.36	...	2	2
N7412	B	Sc I-II	-20.25	-0.01	...		
N7421	B	SBbc II-III	-19.72	+0.03	...		
I5267	R	Sa	-20.80	+0.37	...	1	1
I1459	R	E4	-20.88	+0.51	...		
N7424	B	Sc II-III	-19.94	-0.16	...		

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
I5271	B	Sb II	-20.00	+0.06	...	2	2
I5273	B	SBc II-III	-19.83	-0.03	...		
N7448	B	Sc II	-21.25	-0.23	G		
N7457	R	S0 1	-19.08	+0.30	F		
N7456	B	Sc II-III	-19.84	-0.22	...		
N7469	B	Sab p	-22.37	-0.43	F		
N7479	B	SBbc I-II	-21.61	+0.08	F	2	2
N7507	R	E0	-20.37	+0.52	...	0	0
N7531	B	Sbc I-II	-20.27	-0.05	...		
N7541	B	Sc II	-21.26	-0.05	F		
N7552	B	SBbc I-II	-20.76	+0.07	...		
N7585	R	S0/Sa	-21.12	+0.44	F	0	1:
N7582	B	SBab	-21.02	+0.18	...	2	2
N7590	B	Sc II	-20.05	-0.06	...		
N7600	R	S0 1	-20.53	+0.41	F	0	0
N7606	B	Sb I	-21.96	+0.04	F	1	2
N7599	B	Sc II	-20.53	-0.17	...		
N7619	R	E3	-21.63	+0.55	C	0	0
N7625	B	S p	-19.65	+0.13	F		
N7626	R	E1	-21.40	+0.54	C	0	0
N7640	B	SBc II:	-19.57	-0.21:	F		
I5325	B	Sc II-III	-19.57	-0.05	...		
N7679	B	Sc/Sa	-21.65	-0.16	G	0:	2
N7690	B	Sab	-19.51	-0.10	...	1	1
I5328	R	S0 1	-21.22	+0.45	...	0	0
N7702	R	Sa	-20.93	+0.40	...	1	1
N7713	B	Sc II-III	-18.87	-0.39	...		
N7716	B	Sab I	-20.53	-0.01	F	2	2
N7721	B	Sbc II	-20.77	-0.22	F		
N7723	B	SBb I-II	-21.02	+0.03	F		
N7727	R	Sa p	-21.25	+0.36	F	?	?
N7741	B	SBc II	-19.47	-0.19	F	1	2
N7742	B	Sa	-20.18	-0.01	F	0	2

Table 1—Continued

Name	Sequence	Type	M_B	$(U - B)_o$	Environment	D	S
N7743	R	SBa	-20.27	+0.35	F	0	1
N7744	R	SB0 1	-20.78	+0.50	...	0	0
N7755	B	SBbc/Sbc I-II	-21.41	+0.01	...		
N7764	B	SBm III	-19.41	-0.38	...		
N7782	B	Sb I-II	-22.15	+0.10	G	1	2
N7785	R	E5	-21.14	+0.52	F	0	0
N7796	R	E1	-21.02	+0.52	...	0	0
N7814	R	Sab	-20.97	+0.41	F	2	0

*I am indebted to Dr. Harold Corwin for pointing out that object "New 5" in the catalog of Sandage & Tammann is probably identical to IC 4946. The morphological type assigned to NGC 2798 might be questioned NGC 3415 is classified as E5 in Sandage & Tammann, but as Sb in Sandage & Bedke.

Table 2. Relation between S0+SB0 subtype and environment

Environment	$S0_1$	$S0_{1/2} + S0_2$	$S0_{2/3} + S0_3$
Field	9	9	3
Group	7	2	4
Cluster	28	6	5

Table 3. Relation between presence of dust and the apparent intensity of star formation

	S = 0	S = 1	S = 2	S = 3
D=0	183	37	4	0
D=1	10	31	37	1
D=2	11	35	35	4
D=3	0	7	7	2

Table 4. Frequency distribution of Hubble types in Table 1

Type	Cluster	Group	Field
E	43	12	12
S0 + SB0	34	9	19
Sa + SBa	19	7	26
Sab + SBab	10	1	11
Sb + SBb	19	13	33
Sbc + SBbc	10	7	27
Sc + SBc	33	25	80

Table 5. Frequency distribution of intrinsic galaxy colors in Table 1 in bins of width 0.10 mag

$(U - B)_o$	Cluster	Group	Field
-0.45	2	4	6
-0.35	4	1	4
-0.25	7	3	21
-0.15	11	10	39
-0.05	20	10	43
+0.05	10	16	34
+0.15	20	6	25
+0.25	28	10	28
+0.35	29	8	21
+0.45	50	14	28
+0.55	36	12	13
+0.65	4	1	2

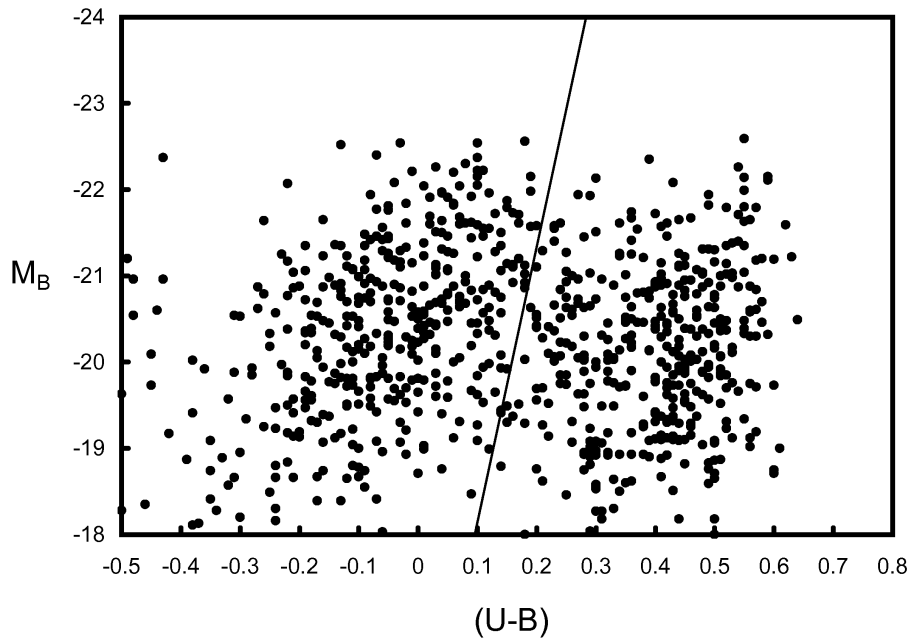


Fig. 1.— Color-magnitude diagram for all Shapley-Ames galaxies for which M_B and $(U-B)_o$ are available from de Vaucouleurs et al.(1991) and Sandage & Tamman (1981). The figure shows that the distribution of galaxy colors is bimodal.

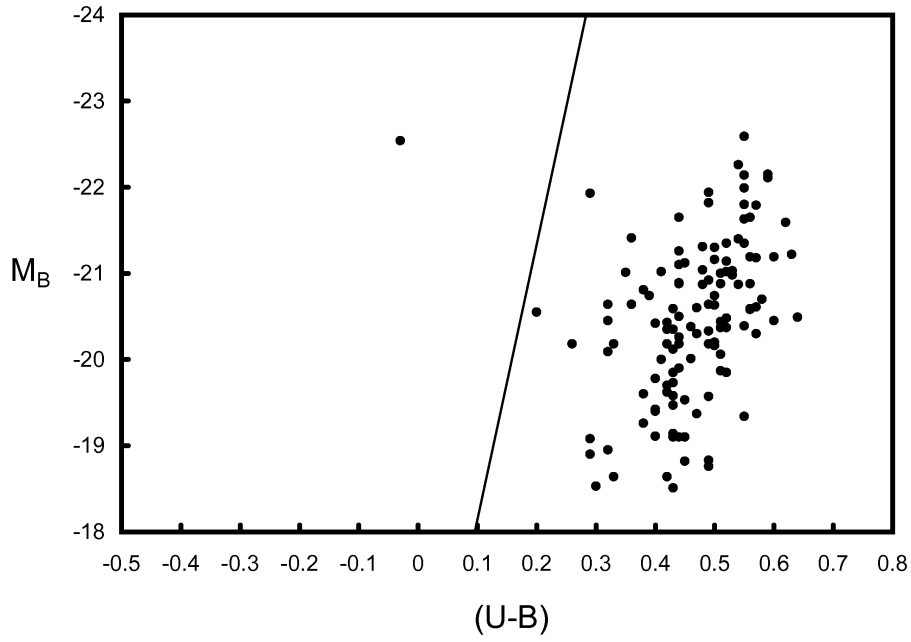


Fig. 2.— Color-magnitude diagram for elliptical galaxies. The deviant blue point represents NGC 1275.

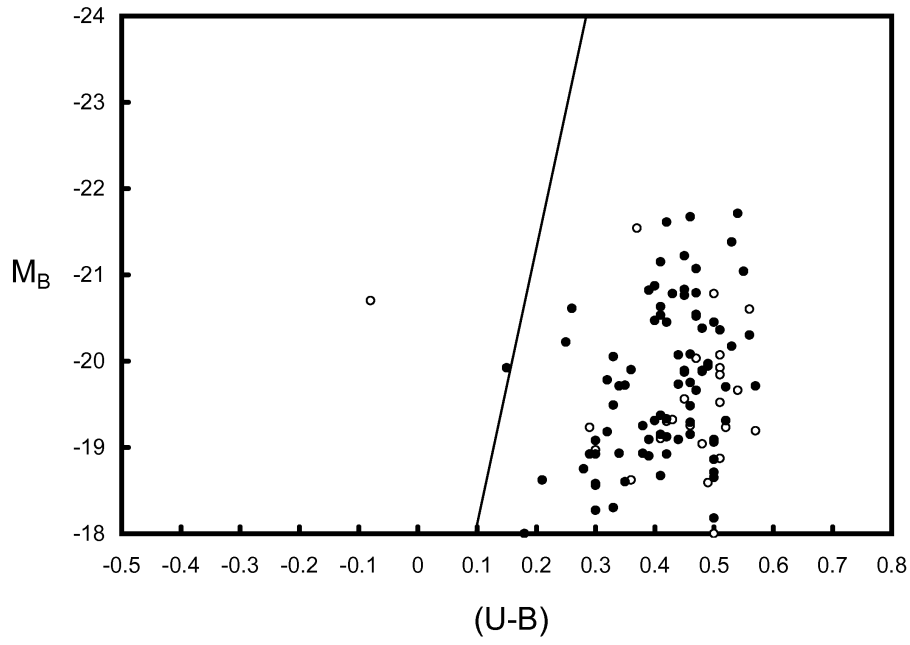


Fig. 3.— Color-magnitude diagram for S0 galaxies (dots) and SB0 galaxies (circles).

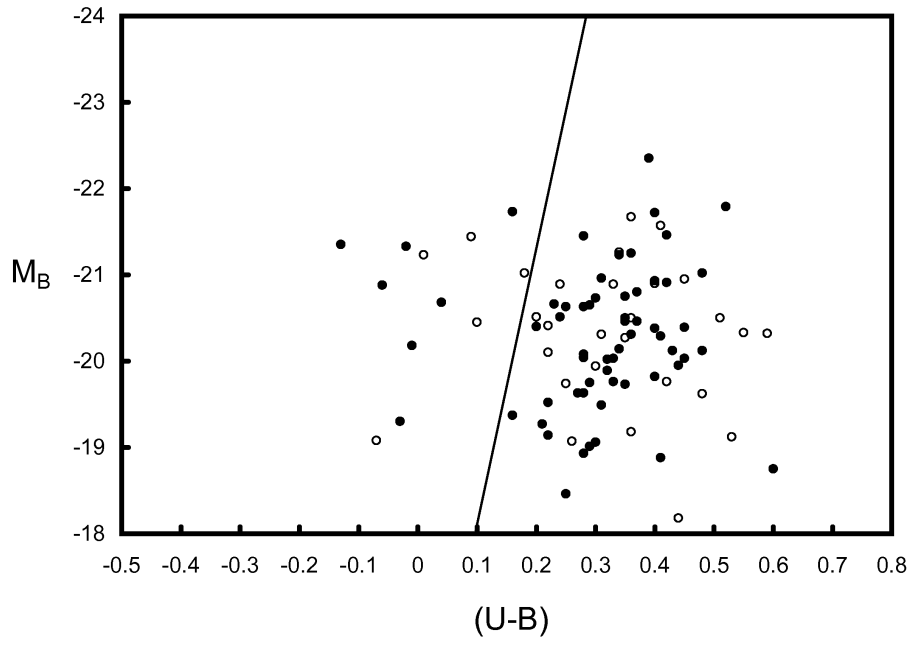


Fig. 4.— Color-magnitude diagram for Sa galaxies (dots) and SBa galaxies (circles).

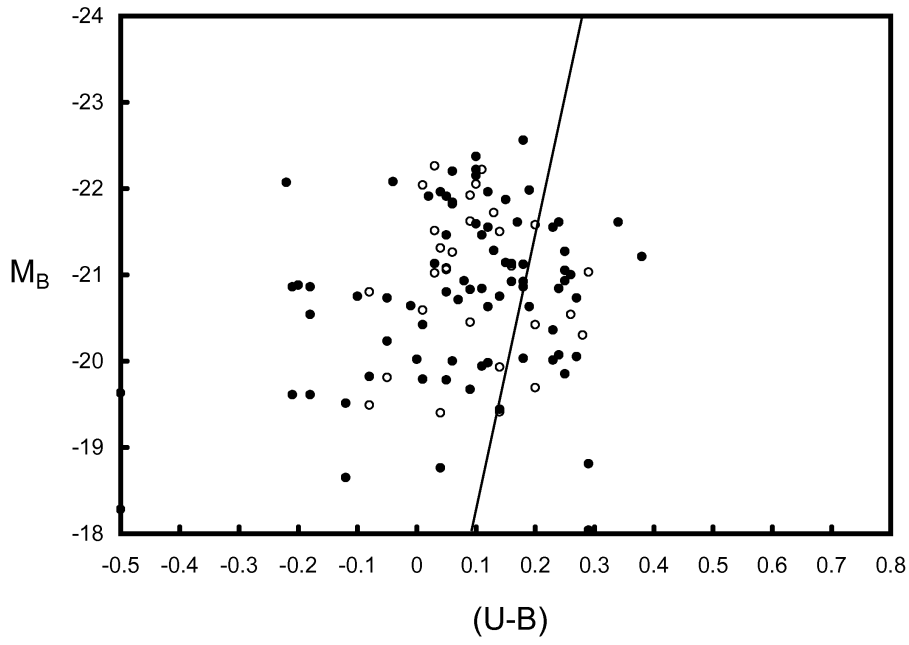


Fig. 5.— Color-magnitude diagram for Sb galaxies (dots) and SBb galaxies (circles).

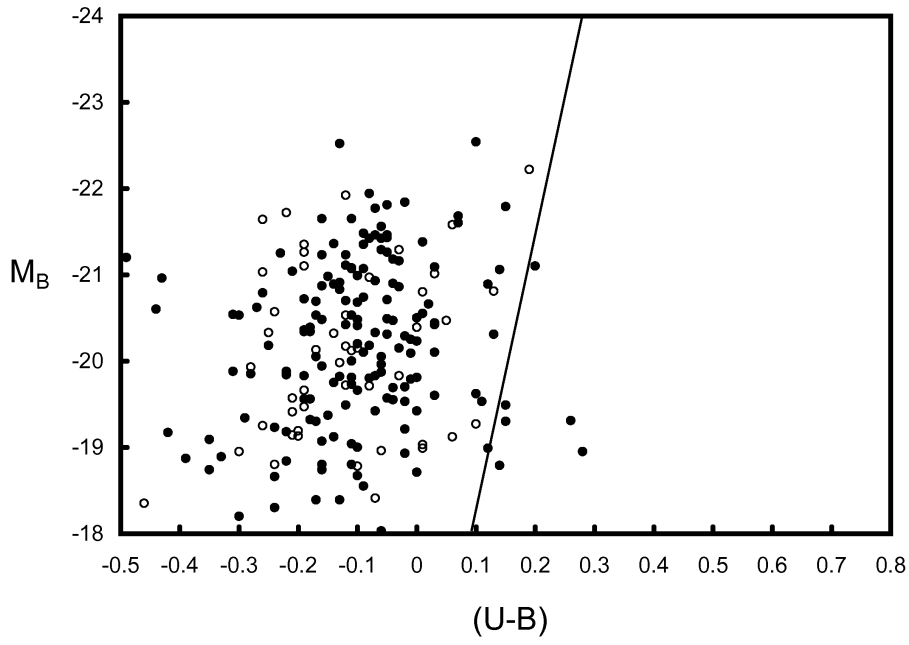


Fig. 6.— Color-magnitude diagram for Sc galaxies (dots) and SBc galaxies (circles).

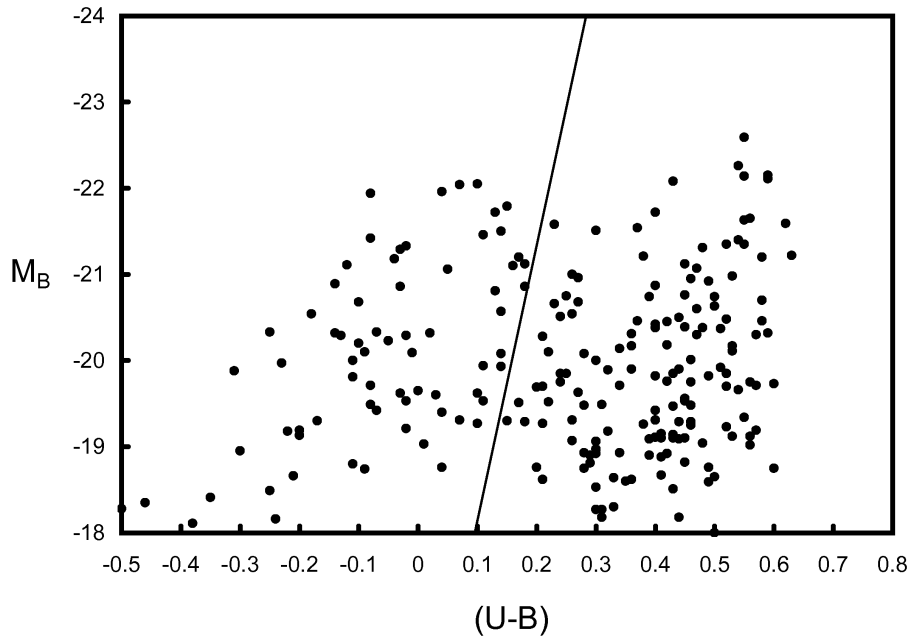


Fig. 7.— Color-magnitude diagram for cluster (C) galaxies in the Shapley-Ames catalog. These objects are seen to mostly be located to the red of Eqn. (1).

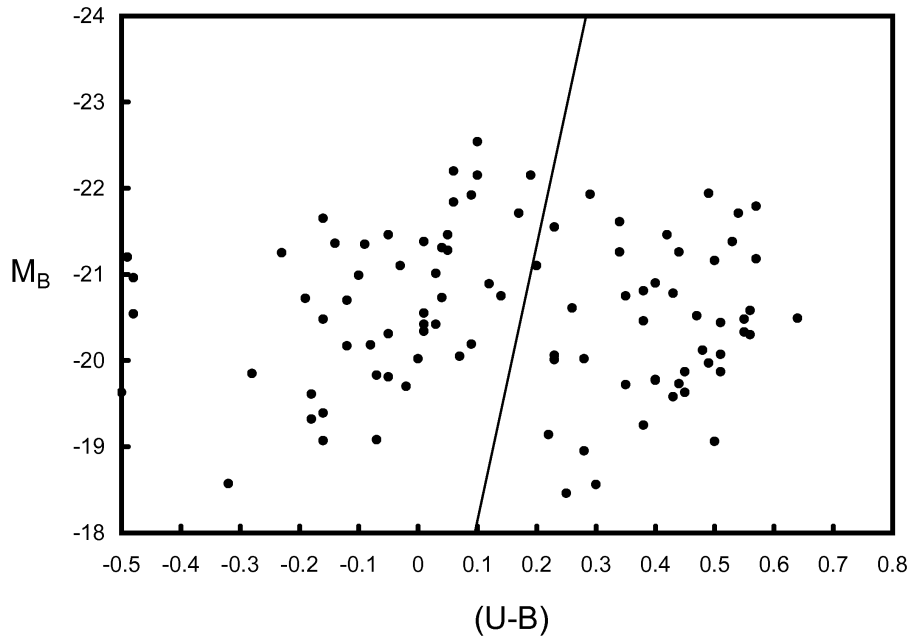


Fig. 8.— Color-magnitude diagram for group (G) galaxies in the Shapley-Ames catalog.

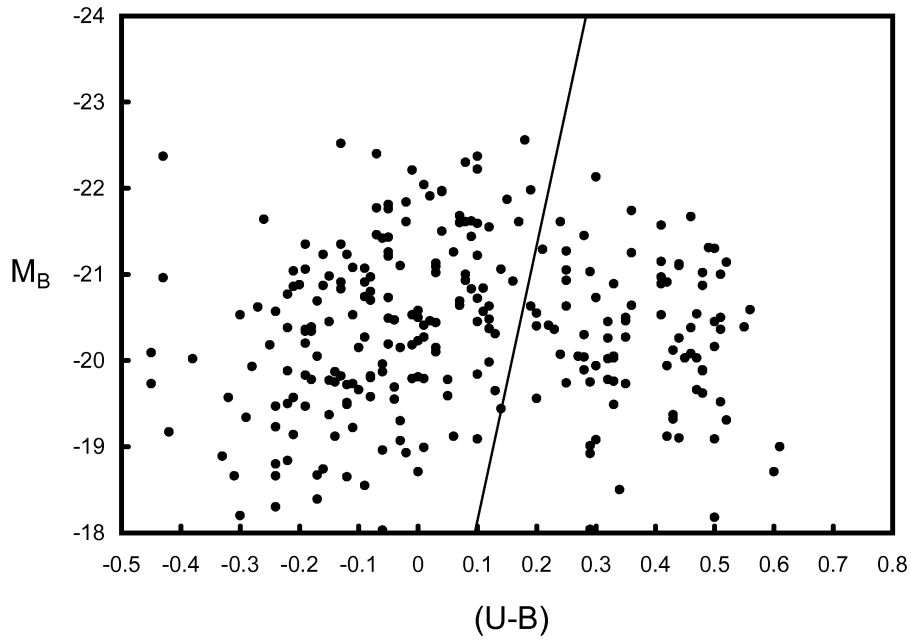


Fig. 9.— Color-magnitude diagram for field (F) galaxies. These objects are seen to be widely scattered in the color-luminosity diagram, but mainly lie to the left (blue) of Eqn.(1).

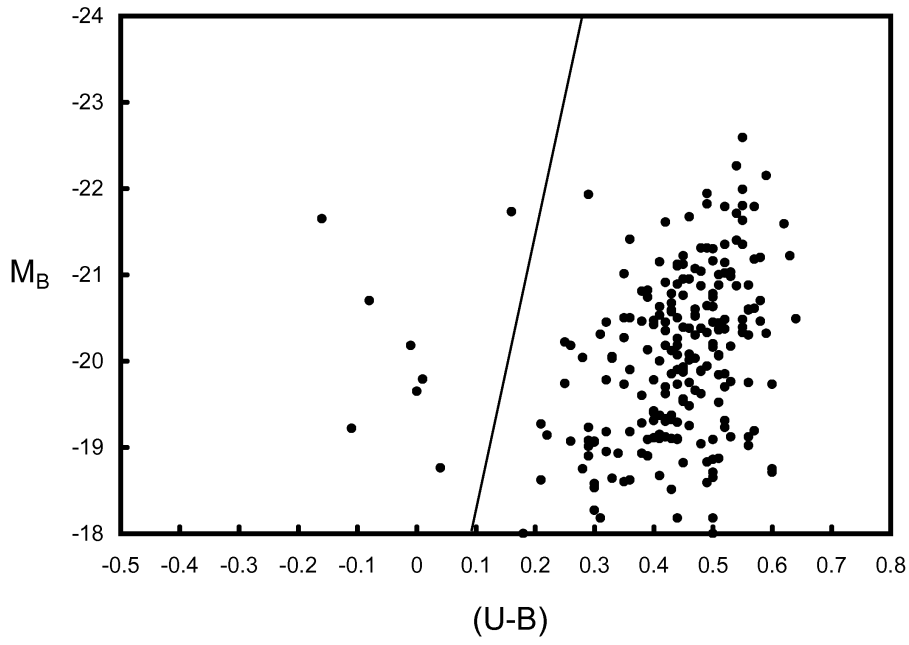


Fig. 10.— Distribution of dustless ($D = 0$) galaxies shows that most of these objects lie along a broad sequence that is situated ~ 0.3 mag to the red of Eqn. (1).

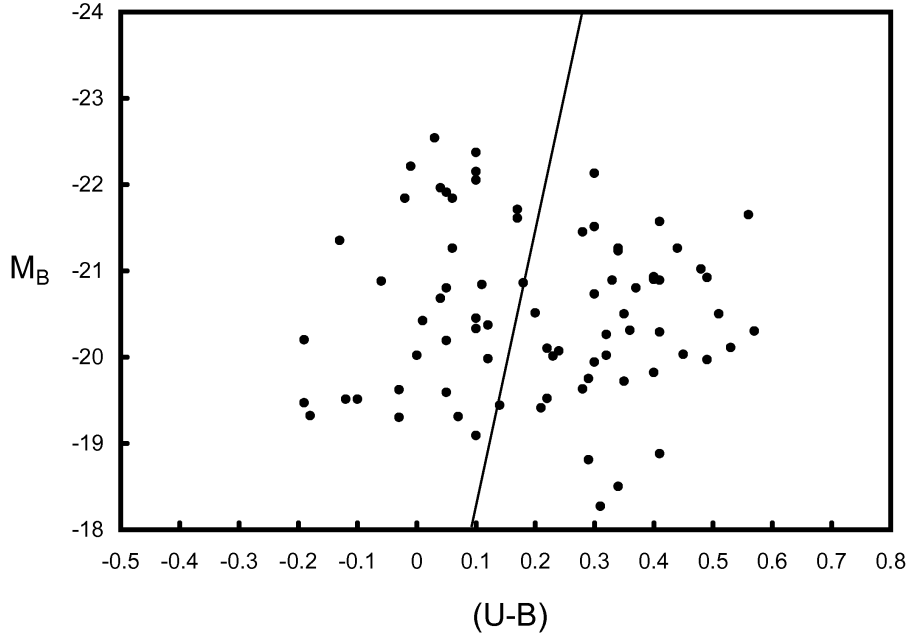


Fig. 11.— Galaxies showing a trace of dust ($D = 1$) are seen to exhibit a much broader distribution of integrated colors

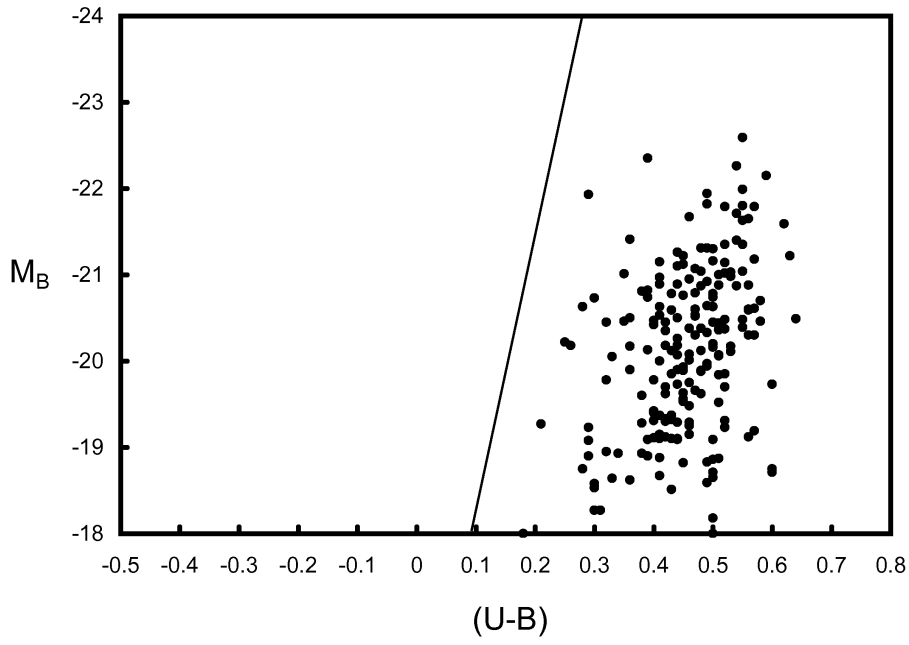


Fig. 12.— Galaxies with no evidence for star formation ($S = 0$) are mostly located close to a sequence situated ~ 0.3 mag to the red of Eqn. (1).

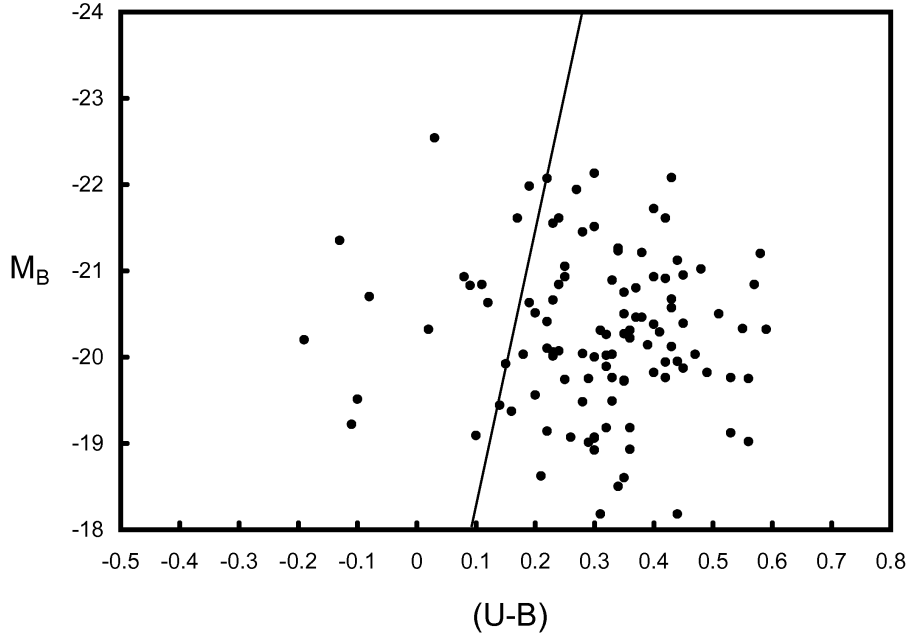


Fig. 13.— Galaxies exhibiting a trace of star formation ($S = 1$) are typically bluer, and show a much wider dispersion in color, than do those in which no star formation is visible